

sixtieth contact. The currents thus obtained (a small battery only being used on the clock) are used to work a relay from which three independent currents from other batteries are derived. One acts upon the seconds magnet of the chronograph for impress of seconds punctures on the paper on the revolving cylinder. The omission of one second in each minute marks with certainty the commencement of the minute. Observations at all the fundamental instruments are registered on this cylinder, and comparisons of clocks are thus entirely avoided. Another current regulates a half-seconds chronometer on the eye-end of the Great Equatorial. The third current regulates the pendulum of a half-seconds clock in the Great Equatorial Room, drives a tapper to make audible the seconds of the clock, and drives also a galvanic chronometer placed in the Computing Room for use in the daily work of comparing and setting to time the mean solar standard clock. The omission of one current in each minute is unimportant as concerns the regulated chronometer and clock, but not so as regards the chronometer which is driven by the current. To accommodate the chronometer to this state of things, its seconds wheel is cut with fifty-nine teeth only, and its seconds circle on the dial correspondingly divided into fifty-nine equal parts. The resting of the hand during one second, which takes place at a particular division of the dial, consequent on the loss of one current in each minute, is therefore compensated for by this construction of the seconds wheel and engraved dial plate.

ARCTIC VEGETATION

A FEW notes on the vegetation of the Arctic regions may not be out of season at the present time. For fuller details we may refer to Dr. Hooker's exhaustive essay on the distribution of Arctic plants, published in the Transactions of the Linnean Society, vol. xxiii., 1862. Since the appearance of this article very little has been added to our knowledge of Arctic vegetation, if we except the flora of Spitzbergen. Several naturalists have since visited the islands of this group, and about thirty additional species of flowering plants have been discovered. The greater part of these additions have been published in the *Journal of Botany*, vol. ii. pp. 130 to 137 and 162 to 176, and vol. i., series 2, p. 152; but a few interesting plants new to the group, collected by the Rev. Mr. Eaton, and now in the Herbarium at Kew, do not appear to have been published. With the exception of the shores of Smith's Sound in North America, Spitzbergen is the most northerly land yet trodden by the foot of restless explorers, and from its relative accessibility its vegetation is perhaps better known than any other part lying far within the Arctic circle. For this reason, and on account of their high latitude, we have chosen the vegetation of the Spitzbergen Islands to illustrate the whole flora of the Arctic regions. We have been influenced in this choice, too, by the fact that many of the species there represented are indigenous in Britain. Most of these species, it should be stated, are confined to the mountains of the north of England and Scotland.

To give a general idea of the whole flora of the North Frigid Zone, we may quote a few of Dr. Hooker's figures. By way of explanation it should be mentioned that Dr. Hooker takes a very broad view of species, and many forms considered as distinct species by some botanists here count as varieties. The more recent additions to the flora of Spitzbergen would not materially alter these figures, because the same species were all, or nearly all, previously known to exist in Arctic Continental Europe or America. A few deductions would also probably have to be made. For instance, the Reed-mace, *Typha*, appears to have been included by mistake in the list of Arctic American plants. The total number of species of flowering plants—with

which alone we shall concern ourselves—given, is 762, of which about fifty are exclusively confined to the Arctic regions. A very large proportion of these are found in Scandinavia, south of the Arctic circle, and reappear in the Alps; a few reach the Alpine regions of the mountains of India and Africa, and a few reappear in the extreme south of the southern hemisphere. In a less degree the same thing occurs from north to south on the American continent. Of these 762 species, 616 have been observed in Arctic Europe, 233 in Arctic Asia, 364 in Arctic West America, 379 in Arctic East America, and 207 in Arctic Greenland. From the proportions the respective figures for the five different areas bear to the total, it will be seen that nearly all the areas must have a majority of species in common, and that each area has very few species peculiar to itself. Before proceeding to give a sketch of the flora of Spitzbergen, there is one remarkable fact deserving of special notice. Of the 207 species found in Greenland, 195 are Scandinavian types, and only 12 are American or Asiatic types.

A glance at the map for the position of the Spitzbergen group will enable the reader to realise more fully the interest attached to the investigation of the plants and animals of a small isolated tract of land in so high a latitude—between $76^{\circ} 33'$ and $80^{\circ} 50'$ —especially when told that the highest point at which flowering plants have hitherto been seen is about 82° , or within 8° of the pole, in Smith's Sound. The geological formation of the group is of the earliest. So far as at present known it consists of granite and other crystalline rocks, and in the south traces of the Carboniferous and Permian strata have been discovered. The climate of Spitzbergen is modified to a certain extent, like the whole of Western Europe, by oceanic streams flowing from the hot regions northwards. Nevertheless, it is exceedingly rigorous, as may be imagined from the fact that the sun never rises more than 37° above the horizon, and the winter is of ten months' duration. From the observations of Phipps, Parry, Scoresby, and several foreign explorers, the mean temperature of July, the warmest month, has been estimated at about 37° Fahr., and the highest point observed by Scoresby was 51° on the 29th of July, 1815. The mean temperature of the year is about 17° Fahr., and the mean temperature of the three winter months (Dec., Jan., and Feb.) is calculated at about zero of Fahrenheit. Of course the preceding figures must be treated as very rough approximations only.

From the foregoing brief sketch of the climatal and other conditions of Spitzbergen, a very limited number of flowering plants would be expected to thrive, but at least one hundred species have been observed—a comparatively rich flora, when we consider that it is only in the most favourable situations that they can exist at all. Nearly the whole of the vegetation consists of herbaceous perennials, about one-third being grasses, sedges, and rushes. The nearest approach to woody vegetation are the crowberry (*Empetrum nigrum*), two species of willow (*Salix reticulata* and *S. polaris*), and *Andromeda tetragona*, an Ericaceous under-shrub, neither of which rises more than a few inches above the soil. Taking the families in their natural sequence, we have—1. Ranunculaceæ: six species of *Ranunculus*, and probably seven, a fragment in the Kew Herbarium, collected by the Rev. Mr. Eaton, appearing to be *R. acris*. 2. Papaveraceæ: *Papaver nudicaule*, a pretty dwarf yellow-flowered poppy. 3. Cruciferae: about eighteen species, including *Cardamine pratensis*, ten species of *Draba*, and one species of scurvy grass, *Cochlearia fenestrata*, perhaps the only esculent vegetable found in Spitzbergen, which has proved most valuable to the crews of the vessels that have touched there. 4. Caryophyllæ: about a dozen species, including the following British—*Silene acaulis*, *Arenaria ciliata*, *A. peplioides*, and *A. rubella*. 5. Rosaceæ: four species of *Potentilla* and

Dryas octopetala. 6. Saxifragæ: *Chrysosplenium alternifolium*, *Saxifraga oppositifolia*, *nivalis*, *cernua*, *caspiotosa*, *hirculus*, *aizoides*, and four other species not found in Britain. 7. Compositæ: four species, including the dandelion. 8. Campanulacæ: *Campanula uniflora*. 9. Ericacæ: the little shrub mentioned above. 10. Gentianacæ: *Gentiana tenella*, discovered by the Rev. Mr. Eaton in 1872. 11. Boraginacæ: *Mertensia maritima*. 12. Polemoniaceæ: one species of *Polemonium*. 13. Scrophulariaceæ: *Pedicularis hirsuta*. 14. Empetracæ: the *Empetrum* alluded to. 15. Polygonæ: two British species, *Polygonum viviparum*, and *Oxyria reniformis*; and *Koenigia islandica*, which is of annual duration. 16. Salicineæ: the two species of willow given above. The remaining families—(17) Juncacæ, (18) Cyperacæ, and (19) Gramineæ—make up the rest, the latter being by far the most numerous, and embracing several British genera and species.

In a broad sense, the Arctic vegetation closely resembles the flora of the higher Alps, but there is less brilliancy and variety of colour in the flowers, yellow and white largely predominating. The plants assume a dense tufted habit of growth, and increase mainly by lateral branches, which take root and in their turn produce offsets. It is possible some or all of them ripen seeds in certain favourable seasons, but the almost total absence of annual plants, and the habit of growth of the perennials, seem to indicate that this very seldom happens. An attentive study of the distribution of Arctic flowering plants would lead us to believe that few new species remain to be discovered; and probably in the lower cryptogams also, few absolutely new forms will be found, though doubtless many known species occur that have not yet been collected. Therefore there is some justness in the complaints of geologists because no geologist has been appointed to the Arctic Expedition, whereas a botanist has been appointed. We may reproduce here the substance of an interesting note on the most northerly species of flowering plants known, which was communicated to this journal (vol. viii. p. 487) by Dr. J. D. Hooker. The four following plants, collected by Dr. Bessel in 82° N. lat., probably on the east side of Smith's Sound, represent the extreme northern limits of phanerogamic vegetation so far as at present known: *Draba alpina*, *Cerastium alpinum*, *Taraxacum dens-leonis* var., and *Poa alpina*. With the exception of the first, these are also indigenous in Britain. We have one more observation to make. Although there is what botanists term an Antarctic flora, not a single flowering plant has been found within the Antarctic circle, and only a very limited number of the lower cryptogams.

NOTES

THE late Sir Charles Lyell has not been forgetful of the interests of science in his will. He gives to the Geological Society of London the die executed by Mr. Leonard Wyon, of a medal to be cast in bronze, to be given annually and called the Lyell Medal, to be regarded as a mark of honorary distinction and as an expression on the part of the governing body of the Society that the medallist (who may be of any country or either sex) has deserved well of the science. He further gives to the said Society the sum of 2,000*l.*, the annual interest arising therefrom to be appropriated and applied in the following manner:—Not less than one-third of the annual interest to accompany the medal, the remaining interest to be given in one or more portions at the discretion of the Council for the encouragement of geology, or of any of the allied sciences by which they shall consider geology to have been most materially advanced, either for travelling expenses or for a memoir or paper published or in progress, and without reference to the sex or nationality of the author or the language in which it may be written. The Council of the Society

are to be the sole judges of the merits of the memoirs or papers for which they may vote the medal and fund from time to time.

LORD LINDSAY, writing from Florence to the Mayor of Wigan, of which place his lordship is representative, states that in order to recover from the severe effect of the Mauritius fever, caught while observing the recent transit, he is obliged to stay in Italy to recruit. He hopes, however, to be able to return to England by the time Parliament resumes its sittings.

PROF. H. E. ARMSTRONG, of the London Institution, well known for his researches in organic chemistry, and Mr. W. N. Hartley, Demonstrator of Chemistry in King's College, are candidates for the Jacksonian Professorship of Experimental Philosophy in the University of Cambridge. It will be interesting to watch what course the Cambridge authorities will take with regard to the appointment to the vacant chair.

MR. E. J. NANSON, B.A., Fellow of Trinity College, Cambridge, Professor of Applied Mathematics at the Royal Indian Engineering College, Cooper's Hill, has been selected by Prof. Adams to succeed the late Prof. W. P. Wilson in the chair of Mathematics at the University of Melbourne. Mr. Nanson was Second Wrangler and Second Smith's Prizeman in 1873.

THE French National Assembly have unanimously voted the funds for the creation of a third Chair of Chemistry in the Faculty of Sciences of Paris. The new chair is to be devoted to Organic Chemistry, which, owing to the arrangements with regard to the other two chairs, has hitherto been somewhat neglected.

A CORRESPONDENT sends us the following query on the subject of Arctic Meteorology with reference to the forthcoming Arctic Expedition:—"I have noted from time to time in the pages of NATURE the various items of information respecting the outfit for the Arctic Expedition, but have failed to ascertain what, if any, preparations are being made for the observation of meteorological phenomena. We know little or nothing about the amount of aqueous deposition in the Arctic regions. Are not the vessels supplied with rain-gauges? Surely there will be many opportunities of recording the quantity of rainfall or snowfall, during several months at different stations, or even the hourly rate of deposition at the time of storms. Anemometers, too, might be employed to register the velocity or pressure of wind."

IN reply to Mr. Fisher's query (NATURE, vol. xi. p. 364) as to a satisfactory method of killing *Hoplophora decumana*, a correspondent recommends the following method:—First stupify the insect by dropping it into some benzole, or similar fluid, and then pierce it with a needle that has been dipped into a solution of corrosive sublimate.

AMONG the list of Friday evening lecturers at the Royal Institution noted in last week's NATURE, we should have given the name of Prof. Tyndall, F.R.S., whose subject, however, has not yet been announced.

IN the notice of Mr. Hart's list of the flowering plants and ferns of the Arran Islands, Galway Bay (vol. xi. p. 395), we inadvertently gave *Daboecia polifolia* as one of the West European or Atlantic types characterising this flora. This is a bog plant found in Connemara and Mayo, but it does not occur in the Arran Islands, nor are there suitable localities for it, neither is it included by Mr. Hart.

AT the next congress of French meteorologists, which is to be held at Paris in a few days, M. Leverrier will propose to experiment on a large scale for the purpose of testing the efficacy of smoke in preventing young plants from being damaged by the frosty mornings so common in April.